

Claim Amendments

IN THE CLAIMS:

Please amend Claim 1 as follows.

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1. (Currently Amended) A process cartridge detachably mountable to a main body of an electrophotographic image forming apparatus for forming an image on a recording medium, the main body having a twisted hole whose cross-section has a plurality of corners, said process cartridge comprising:

- an electrophotographic photosensitive drum;
- a developing roller for developing an electrostatic latent image formed on said electrophotographic photosensitive drum; and
- a driving-force transmitting part provided on one lengthwise end of said electrophotographic photosensitive drum, said driving-force transmitting part having a twisted protrusion to be fitted in the twisted hole, wherein a cross-section of the said twisted protrusion has a plurality of corners,
- a shaft supported by a bearing portion,
- a gear portion for transmitting a driving force to said developing roller, said shaft and said gear portion overlapping each other in an axial direction of said electrophotographic photosensitive drum, and
- a second gear portion provided in juxtaposed relationship with said gear portion, and wherein said second gear portion transmits a driving force to a transfer roller provided in the main body of the apparatus,

wherein when the twisted hole is rotated with said protrusion fitted in the twisted hole when said process cartridge is mounted to the main body of the apparatus, a rotational

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force of the twisted hole is transmitted to said electrophotographic photosensitive drum through said protrusion.

2. (Previously Amended) A process cartridge according to Claim 1,
wherein said photosensitive drum comprises a drum cylinder,
wherein said driving-force transmitting part further has a coupling portion fitted and fixed to one end of said drum cylinder of said photosensitive drum,
wherein said shaft has a shaft portion overlapping said gear portion, and
wherein said coupling portion, said gear portion, said shaft portion overlapping said gear portion, and said protrusion are provided on an end surface of said shaft and are disposed in said axial direction in the named order, and said coupling portion, said gear portion, said shaft portion overlapping said gear portion, and said protrusion are formed into one united body.

3. (Cancelled)

4. (Previously Amended) A process cartridge according to Claim 2,
wherein a through-hole is formed through said coupling portion, said gear portion, said shaft portion overlapping said gear portion, and said protrusion,
wherein a grounding pin is provided in the through-hole,
wherein said grounding pin is provided on the inner end surface of said driving-force transmitting part, and is in contact with a grounding plate which is in contact with the inner surface of said drum cylinder, whereby when said process cartridge is

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mounted to the main body of the apparatus, said grounding pin comes into contact with a main body grounding contact provided in the twisted hole, and said electrophotographic photosensitive drum is electrically grounded to the main body of the apparatus.

5. (Previously Amended) A process cartridge according to Claim 1, 2, or 4, wherein a portion of said shaft is surrounded by said gear portion.

6. (Previously Amended) A process cartridge according to Claim 1, 2, or 4, wherein the cross-section of the twisted hole is a substantially equilateral triangle, and the cross-section of said protrusion is a substantially equilateral triangle.

7. (Previously Amended) An electrophotographic photosensitive drum used in an electrophotographic image forming apparatus for forming an image on a recording medium, the electrophotographic image forming apparatus having a twisted hole the cross-section of which has a plurality of corners, said electrophotographic photosensitive drum comprising:

a drum cylinder having a photosensitive layer on a peripheral surface thereof; and
a driving-force transmitting part mounted on one end of said drum cylinder, and
having

a twisted protrusion to be fitted in the twisted hole, wherein a cross-section of said twisted protrusion has a plurality of corners,

a shaft supported by a bearing portion,

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a gear portion for transmitting a driving force to a developing roller, said shaft and said gear portion overlapping each other in an axial direction of said electrophotographic photosensitive drum, and

a second gear portion provided in juxtaposed relationship with said gear portion, and wherein said second gear portion transmits a driving force to a transfer roller provided in the main body of the apparatus,

wherein when the twisted hole is rotated with said protrusion fitted in the twisted hole when said photosensitive drum is mounted to the main body of the apparatus, a driving force for rotating said electrophotographic photosensitive drum is received from the main body of the apparatus.

8. (Previously Amended) An electrophotographic photosensitive drum according to Claim 7, wherein said driving-force transmitting part further has a coupling portion fitted and fixed to one end of said drum cylinder of said photosensitive drum,

wherein said shaft comprises a shaft portion overlapping said gear portion, wherein said coupling portion, said gear portion, said shaft portion overlapping said gear portion, and said protrusion are provided on an end surface of said shaft and are disposed in said axial direction in the named order, and

wherein said coupling portion, said gear portion, said shaft portion overlapping said gear portion, and said protrusion are formed into one united body.

9. (Canceled)

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10. (Previously Amended) An electrophotographic photosensitive drum according to Claim 8, wherein a through-hole is formed through said coupling portion, said gear portion, said shaft portion overlapping said gear portion, and said protrusion, wherein a grounding pin is provided in the through-hole, wherein said grounding pin is provided on the inner end surface of said driving-force transmitting part, and is in contact with a grounding plate which is in contact with the inner surface of said drum cylinder, whereby when said electrophotographic photosensitive drum is mounted to the main body of the apparatus, said grounding pin comes into contact with a main body grounding contact provided in said twisted hole, and said electrophotographic photosensitive drum is electrically grounded to the main body of the apparatus.

11. (Previously Amended) An electrophotographic photosensitive drum according to Claim 7, 8, or 10, wherein a portion of said shaft is surrounded by said gear portion.

12. (Previously Amended) An electrophotographic photosensitive drum according to Claim 7, 8, or 10, wherein the cross-section of the twisted hole is a substantially equilateral triangle, and the cross-section of said protrusion is a substantially equilateral triangle.

13. (Previously Amended) A driving-force transmitting part mounted on one end of an electrophotographic photosensitive drum used in a process cartridge detachably mountable to a main body of an electrophotographic image forming apparatus for forming

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an image on a recording medium, the electrophotographic image forming apparatus having a twisted hole whose cross-section has a plurality of corners, said driving-force transmitting part comprising:

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a twisted protrusion to be fitted into the twisted hole when the process cartridge is mounted to the main body of the apparatus, wherein a cross-section of said twisted protrusion had a plurality of corners;

a shaft supported by a bearing portion when said driving-force transmitting part is mounted in the process cartridge;

a gear portion for transmitting a driving force to a developing roller, wherein said shaft comprises a shaft portion at which said shaft and said gear portion overlap each other in an axial direction of the electrophotographic photosensitive drum, and

a second gear portion provided in juxtaposed relationship with said gear portion, wherein said second gear portion transmits a driving force to a transfer roller provided in the main body of the apparatus,

wherein when the twisted hole is rotated with said protrusion fitted in the twisted hole when the process cartridge is mounted to the main body of the apparatus, the rotational force of the twisted hole is received by said protrusion for rotating the electrophotographic photosensitive drum from the rotational force from the main body of the apparatus.

14. (Previously Amended) A driving-force transmitting part according to Claim 13,

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wherein the electrophotographic photosensitive drum comprises a drum cylinder,
wherein said driving-force receiving part further comprises a coupling portion fitted
and fixed to one end of the drum cylinder of the photosensitive drum, wherein said
coupling portion, said gear portion, a shaft portion overlapping said gear portion, and said
protrusion are provided on an end surface of said shaft and are disposed in said axial
direction in the named order,

wherein said coupling portion, said gear portion, said shaft portion overlapping said
gear portion, and said protrusion are formed into one united body.

15. (Canceled)

16. (Previously Amended) A driving-force transmitting part according to Claim
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wherein a through-hole is formed through said coupling portion, said gear portion,
said shaft portion overlapping said gear portion, and said protrusion,

wherein a grounding pin is provided in the through-hole,

wherein said grounding pin is provided on the inner end surface of said
driving-force transmitting part, and is in contact with a grounding plate which is in contact
with the inner surface of the drum cylinder, whereby when the process cartridge is mounted
to the main body of the apparatus, said grounding pin comes into contact with a main body
grounding contact provided in the twisted hole, and the electrophotographic photosensitive
drum is electrically grounded to the main body of the apparatus.

17. (Previously Amended) A driving-force transmitting part according to Claim 13, 14, or 16, wherein a portion of said shaft is surrounded by said gear portion.

18. (Previously Amended) A driving-force transmitting part according to Claim 13, 14, or 16, wherein the cross-section of the twisted hole is a substantially equilateral triangle, and the cross-section of said protrusion is a substantially equilateral triangle.

19. (Previously Amended) An electrophotographic image forming apparatus to which a process cartridge is detachably mountable for forming an image on a recording medium, comprising:

(a) a twisted hole whose cross-section has a plurality of corners; and

(b) a mounting portion for detachably mounting the process cartridge, the process cartridge having:

an electrophotographic photosensitive drum;

a developing roller for developing an electrostatic latent image formed on the electrophotographic photosensitive drum;

a driving-force transmitting part provided on one lengthwise end of the electrophotographic photosensitive drum, and having

a twisted protrusion to be fitted in said twisted hole, wherein a cross-section of the twisted protrusion has a plurality of corners,

a shaft portion supported by a bearing portion,

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a gear portion for transmitting a driving force to the developing roller, wherein the shaft comprises a shaft portion where said shaft and the gear portion overlap each other in an axial direction of said electrophotographic photosensitive drum, and

a second gear portion provided in juxtaposed relationship with said gear portion, and said second gear portion transmits a driving force to a transfer roller provided in the main body of the apparatus,

wherein when said twisted hole is rotated with said protrusion fitted in said twisted hole when the process cartridge is mounted to the main body of said apparatus, the rotation of said twisted hole is transmitted to the electrophotographic photosensitive drum through the protrusion.

20. (Previously Amended) An electrophotographic photosensitive drum for use in a process cartridge detachably mountable to a main body of an electrophotographic image forming apparatus for forming an image on a recording medium, the main body having a motor, an apparatus main body gear for transmitting a driving force of the motor, and a non-circular twisted hole rotated with the apparatus main body gear, a cross-section of the twisted hole having a plurality of corners, said electrophotographic photosensitive drum comprising:

- a. a cylinder having a photosensitive layer on the peripheral surface thereof; and
- b. a driving-force transmitting part mounted on one end of said cylinder, said driving-force transmitting part comprising:

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a spur gear for transmitting a driving force received from the main body of the apparatus to a transfer roller provided in the main body of the apparatus when the process cartridge is mounted to the main body of the apparatus,

a helical gear provided in juxtaposed relationship with said spur gear for transmitting the driving force received from the main body of the apparatus to a developing roller provided in the process cartridge when the process cartridge is mounted to the main body of the apparatus,

a shaft portion provided in juxtaposed relationship with said helical gear, and rotatably supported by a bearing portion when said photosensitive drum is mounted in the process cartridge, and

a non-circular twisted protrusion fitted into the twisted hole provided in the main body of the apparatus, to receive the transmission of the driving force from the main body of the apparatus, the cross-section of which has a plurality of corners,

wherein when said photosensitive drum is mounted in the process cartridge, said shaft portion has an area overlapping an area in which said helical gear is provided, and

wherein the driving force received from the main body of the apparatus through the twisted hole and said protrusion is transmitted to said cylinder through said helical gear and said spur gear, and is transmitted to the developing roller through said helical gear, and is transmitted to the transfer roller through said spur gear.

21. (Previously Amended) An electrophotographic photosensitive drum according to Claim 20, wherein on the end surface of said helical gear, a circular recess is provided on a line coaxial with an axis, and the bearing portion slides with the outer peripheral

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surface of said shaft portion and the inner peripheral surface of said recess which is continuous from said outer peripheral surface, and rotatably supports said shaft portion and said recess.

22. (Previously Amended) An electrophotographic photosensitive drum according to Claim 21, further comprising a grounding member for grounding said photosensitive drum to the main body of the apparatus when the process cartridge is mounted to the main body of the apparatus, said grounding member being provided at the center of said driving-force transmitting part in an axial direction thereof.

23. (Previously Amended) An electrophotographic photosensitive drum according to Claim 20, 21 or 22, wherein said driving-force transmitting part is one united body made of resin into which a fitted portion fitted to one end of said cylinder, said spur gear, said helical gear and said protrusion is formed integrally.

24. (Previously Amended) An electrophotographic photosensitive drum according to Claim 20, 21, or 22 or, wherein the tooth width of said spur gear is narrower than the tooth width of said helical gear, and the number of teeth of said spur gear is smaller than the number of teeth of said helical gear.

25. (Previously Amended) An electrophotographic photosensitive drum according to Claim 20, 21, or 22, wherein the shape of said protrusion is a twisted substantially equilateral triangular prism, wherein the corners of said substantially equilateral triangular

prism are chamfered, and said protrusion is fitted into the twisted hole whose cross-section is a substantially equilateral triangle.

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26. (Previously Amended) A process cartridge detachably mountable to a main body of an electrophotographic image forming apparatus for forming an image on a recording medium, the electrophotographic image forming apparatus having a motor, a main body gear for transmitting a driving force of the motor, and a non-circular twisted hole provided in a central portion of the main body gear and rotated with the main body gear, wherein a cross-section of the twisted hole has a plurality of corners, said process cartridge comprising:

(a) an electrophotographic photosensitive drum having:

- a. a cylinder having a photosensitive layer on a peripheral surface thereof; and
- b. a driving-force transmitting part mounted on one end of said cylinder and

having

a spur gear for transmitting a driving force received from the main body of the apparatus to a transfer roller provided in the main body of the apparatus when said process cartridge is mounted to the main body of the apparatus,

a helical gear provided in juxtaposed relationship with said spur gear for transmitting the driving force received from the main body of the apparatus to a developing roller provided in said process cartridge when said process cartridge is mounted to the main body of the apparatus,

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a shaft portion provided in juxtaposed relationship with said helical gear,
and rotatably supported by a bearing portion when said photosensitive drum is mounted in
said process cartridge, and

a non-circular twisted protrusion to be fitted into the twisted hole when said
process cartridge is mounted to the main body of the apparatus to receive the transmission
of the driving force from the main body of the apparatus and whose cross-section has a
plurality of corners,

wherein when said photosensitive drum is mounted in said process cartridge in the
axial direction thereof, said shaft portion has an area overlapping an area in which said
helical gear is provided, and transmits the driving force received from the main body of the
apparatus to said cylinder through said helical gear and said spur gear, and transmits the
driving force to said developing roller through said helical gear, and transmits the driving
force to the transfer roller through said spur gear; and

(b) said developing roller for developing an electrostatic latent image formed on
said photosensitive drum.

27. (Previously Amended) A process cartridge according to Claim 26, wherein on
the end surface of said helical gear, a circular recess is provided on a line coaxial with an
axis, and the bearing portion slides with the outer peripheral surface of said shaft portion
and the inner peripheral surface of said recess which is continuous from said outer
peripheral surface, and rotatably supports said shaft portion and said recess.

28. (Previously Amended) A process cartridge according to Claim 26 or 27, further comprising a grounding member for grounding said photosensitive drum to the main body of the apparatus when said process cartridge is mounted to the main body of the apparatus, said grounding member being provided at the center of said driving-force transmitting part in an axial direction thereof.

29. (Previously Amended) A process cartridge according to Claim 26 or 27, wherein said driving-force transmitting part is one united body made of resin into which a fitted portion fitted to one end of said cylinder, said spur gear, said helical gear and said protrusion is formed integrally.

30. (Previously Amended) A process cartridge according to Claim 26 or 27, wherein the tooth width of said spur gear is narrower than the tooth width of said helical gear, and the number of teeth of said spur gear is smaller than the number of teeth of said helical gear.

31. (Previously Amended) A process cartridge according to Claim 26 or 27, wherein the shape of said protrusion is a twisted substantially equilateral triangular prism, wherein the corners of said substantially equilateral triangular prism are chamfered, and wherein said protrusion is fitted in the twisted hole whose cross-section is a substantially equilateral triangle.

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32. (Previously Amended) A driving-force transmitting part for use in a process cartridge detachably mountable to a main body of an electrophotographic image forming apparatus for forming an image on a recording medium, the electrophotographic image forming apparatus having a motor, a main body gear for transmitting a driving force of the motor, and a non-circular twisted hole formed in the central portion of the main body gear and rotated with the main body gear, wherein a cross-section of the twisted hole has a plurality of corners, said driving-force transmitting part comprising:

a fitted portion to be fitted to a cylinder of an electrophotographic photosensitive drum in order to be mounted on one end of the cylinder;

a spur gear for transmitting a driving force received from the main body of the apparatus to a transfer roller provided in the main body of the apparatus when the process cartridge is mounted to the main body of the apparatus;

a helical gear provided in juxtaposed relationship with said spur gear for transmitting the driving force received from the main body of the apparatus to a developing roller provided in the process cartridge when the process cartridge is mounted to the main body of the apparatus;

a shaft portion provided in juxtaposed relationship with said helical gear, and rotatably supported by a bearing portion when the photosensitive drum is mounted in the process cartridge; and

a non-circular twisted protrusion to be fitted into the twisted hole to receive the transmission of the driving force from the main body of the apparatus wherein the cross-section of said protrusion has a plurality of corners,

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wherein when the photosensitive drum is mounted in the process cartridge in an axial direction thereof, said shaft portion has an area overlapping an area in which said helical gear is provided, and transmits the driving force received from the main body of the apparatus through the twisted hole and said protrusion to the cylinder through said helical gear and said spur gear, and transmits the driving force to the developing roller through said helical gear, and transmits the driving force to the transfer roller through said spur gear.

33. (Previously Amended) A driving-force transmitting part according to Claim 32, wherein on the end surface of said helical gear, a circular recess is provided on a line coaxial with an axis, and the bearing portion slides with the outer peripheral surface of said shaft portion and the inner peripheral surface of said recess which is continuous from said outer peripheral surface, and rotatably supports said shaft portion and said recess.

34. (Previously Amended) A driving-force transmitting part according to Claim 32 or 33, further comprising a grounding member for grounding the photosensitive drum to the main body of the apparatus when the process cartridge is mounted to the main body of the apparatus, said grounding member being provided at the center of said driving-force transmitting part in an axial direction thereof.

35. (Previously Amended) A driving-force transmitting part according to Claim 32 or 33, wherein said driving-force transmitting part is one united body made of resin into

which the fitted portion to be fitted to one end of said cylinder, said spur gear, said helical gear and said protrusion is formed integrally.

36. (Previously Amended) A driving-force transmitting part according to Claim 32 or 33, wherein the tooth width of said spur gear is narrower than the tooth width of said helical gear, and the number of teeth of said spur gear is smaller than the number of teeth of said helical gear.

37. (Previously Amended) A driving-force transmitting part according to Claim 32 or 33, wherein the shape of said protrusion is a twisted substantially equilateral triangular prism, the corners of said substantially equilateral triangular prism are chamfered, and said protrusion is fitted in the twisted hole whose cross-section is a substantially equilateral triangle.

38. (Previously Amended) An electrophotographic image forming apparatus to which a process cartridge is detachably mountable for forming an image on a recording medium, comprising:

(a) a motor;

(b) a main body gear in a main body of said apparatus for transmitting a driving force of said motor;

(c) a non-circular twisted hole provided in a central portion of said main body gear and rotated with said main body gear, a cross-section of said twisted hole having a plurality of corners;

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(d) a transfer roller for transferring a developed image formed on an electrophotographic photosensitive drum to the recording medium; and

(e) a mounting portion for detachably mounting the process cartridge, the process cartridge having:

(i) the electrophotographic photosensitive drum including:

a. a cylinder having a photosensitive layer on a peripheral surface thereof;

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b. a driving-force transmitting part mounted on one end of the cylinder, and the driving-force transmitting part having

a spur gear for transmitting a driving force received from the main body of said apparatus to said transfer roller when the process cartridge is mounted to the main body of said apparatus,

a helical gear provided in juxtaposed relationship with the spur gear for transmitting the driving force received from the main body of said apparatus to a developing roller provided in the process cartridge when the process cartridge is mounted to the main body of said apparatus,

a shaft portion provided in juxtaposed relationship with the helical gear, and rotatably supported by a bearing portion when the photosensitive drum is mounted in the process cartridge, and

a non-circular twisted protrusion fitted into said twisted hole to receive the transmission of the driving force from the main body of said apparatus when the process cartridge is mounted to the main body of said apparatus, and whose cross-section has a plurality of corners,

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wherein when the photosensitive drum is mounted in the process cartridge in the axial direction thereof, the shaft portion has an area overlapping an area in which the helical gear is provided, and transmits the driving force received from the main body of said apparatus through said twisted hole and the protrusion to said cylinder through the helical gear and the spur gear, and transmits the driving force to said developing roller through the helical gear, and transmits the driving force to said transfer roller through the spur gear; and

(ii) said developing roller for developing an electrostatic latent image formed on the photosensitive drum.